APPLICATION

FOR

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TITLE: BLADE PORTION FOR A HOCKEY STICK

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BLADE PORTION FOR A HOCKEY STICK

Field of the invention

The present invention relates to a blade portion for a hockey stick comprising a wooden shank portion and a blade element made of synthetic material.

Background of the invention

Typical hockey stick blades or replacement blades are generally made of a wooden core reinforced with one or more layers of synthetic material such as fiberglass, carbon fiber or graphite and the likes. The core of the blade may also be made of a plastic material reinforced with layers of synthetic fiber material. The reinforcement layer is usually a woven filament layer, typically soaked in a resin and glued to the surfaces of the blade.

The conventional manufacturing process for a wooden hockey blade involves a large number of operations such as cutting, planing, sanding, laminating, bonding and finishing of the various wood pieces included in the blade. The blade may also be recovering with glass fibers or other composite reinforcement layers or braided glass socks. Curvature of the blade is obtained manually. Since the mechanical properties of the blade may change from one blade to another, even for the same type of wood, and since the curvature is obtained through a manual operation, it is almost impossible to manufacture wooden hockey blades for which the mechanical properties and the curvature are constant from one blade to another. With the composite hockey blade, it is however possible to manufacture hockey blades having specific mechanical properties and a specific curvature. One disadvantage of the composite hockey blade

is that it does not offer a feeling similar to a wooden hockey blade. Indeed, it is recognized that a wooden hockey blade offers a better feeling that a composite hockey blade since the feel of the ground (or ice) and the ball (or puck) is better dispersed in the wood.

Hence, there is a demand for an improved hockey stick blade that offers the feeling of a wooden blade while allowing having specific mechanical properties and a specific curvature.

Summary of the invention

As embodied and broadly described herein, the invention provides a blade portion for a hockey stick, comprising a wooden shank portion, a blade element made of synthetic material and a ground contacting portion. The wooden shank portion has (i) a longitudinal axis; (ii) inner and outer sides extending along said longitudinal axis; (iii) rear and front sides between said inner and outer sides; (iv) a groove on said front side, the groove extending along the longitudinal axis; and (v) a lower edge extending from the rear side to the front side of the wooden shank portion. The blade element includes (i) a proximal end portion, the proximal end portion having a tongue received in the groove of the wooden shank portion; (ii) a distal end portion remote from the proximal end portion; and (iii) a lower edge extending from said front side to said distal end portion, the lower edge of said wooden shank portion being a first lower edge, the lower edge of said blade element being a second lower edge. The ground contacting portion extends from the rear side of the wooden shank portion to the distal end portion of the blade element and it comprises a first segment formed of said first lower edge and a second segment formed of said second lower edge.

Advantageously, the ground contacting portion includes a protective layer. The blade element comprises inner and outer surfaces extending from the front side of the

wooden shank portion to the distal end of the blade element. Moreover, the blade portion comprises inner and outer puck engaging portions formed of inner and outer surfaces that are continuous with inner and outer sides

Furthermore, the blade portion also comprises an inner layer recovering the inner puck engaging portion and an outer layer recovering the outer puck engaging portion, the inner and outer layers made of material having a higher rigidity than the blade element. The blade element is made of foam including fiberglass fibers while inner and outer layers are made of material including wood, glass fibers, carbon fibers, kevlar, aluminum, graphite and/or aramide.

More advantageously, inner and outer layers are first inner and outer layers, the blade portion also comprises second inner and outer layers recovering first inner and outer layers respectively, second inner and outer layers being made of woven materials.

The present invention seeks to provide a blade portion having a weight, stiffness and strength adapted for different hockey players. The hockey player will thus be able to select different combinations of hockey stick shafts and blade portions corresponding to his/her need. While allowing to construct a blade portion having specific mechanical properties by using different materials, the present invention also allows to construct a blade portion that offers a feeling which is similar to a blade portion being entirely made of wood since it comprises a wooden shank portion having a lower edge being part of the bottom portion of the blade portion that contacts the ground.

Other objects and features of the invention will become apparent by reference to the following description and the drawings.

Brief description of the drawings

A detailed description of the preferred embodiments of the present invention is provided herein below, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a blade portion constructed in accordance with the invention;

Figure 2 is an exploded perspective view of a wood shank and a blade element used in the construction of the blade portion of Figure 1;

Figure 3 is a perspective view of the wood shank and blade element of Figure 2;

Figure 4 is an exploded perspective view of the blade portion of Figure 1 before molding, trimming and sanding operations;

Figure 5 is a side view of the blade portion of Figure 1 with a portion being peel off;

Figure 6 is a cross sectional view taken along line 6-6 of Figure 1;

Figure 7 is a cross sectional view taken along line 7-7 of Figure 1;

Figure 8 is a cross sectional view taken along line 8-8 of Figure 1; and

Figure 9 is a side view of the blade portion constructed in accordance with the invention wherein the final blade portion is illustrated in full line and the blade portion before molding, trimming and sanding operations is illustrated in dotted lines.

In the drawings, preferred embodiments of the invention are illustrated by way of examples. It is to be expressly understood that the description and drawings are only for the purpose of illustration and are an aid for understanding. They are not intended to be a definition of the limits of the invention.

Detailed description of preferred embodiments

Figures 1 illustrates a blade portion 10 for a hockey stick. Referring to Figures 1, 5 and 6, blade portion 10 comprises a ground contacting portion 12 and inner and outer puck engaging portions 14 and 16. It is understood that the word "inner" refers to the inside of the curvature of the blade while the word "outer" refers to the outside of the curvature of the blade. In Figure 1, blade portion 10 is for a left hockey stick.

Ground contacting portion 12 comprises first and second segments 18 and 20. First and second segments 18 and 20 contact the ground but it is also understood that these segments contact the ice for a ice hockey stick. Inner puck engaging portion 14 comprises first and second inner puck engaging sections 22 and 24 and outer puck engaging portion 16 comprises first and second puck engaging sections 26 and 28.

Referring to Figures 2, 3 and 5, blade portion 10 comprises a wooden shank portion 30 and a blade element 32. Wooden shank portion 30 comprises a longitudinal axis 34, inner and outer sides 36 and 38 and rear and front sides 40 and 42 between inner and outer sides 36 and 38. As illustrated in Figure 2, wooden shank portion 30 comprises a groove 44 on front side 42, groove 44 extends along longitudinal axis 34. Wooden shank portion 30 also comprises a lower edge 46 extending from rear side 40 to front side 42.

Blade portion 10 is a replacement blade for a hockey stick and wooden shank portion 30 comprises a tenon 48 adapted to be inserted into a hollow hockey stick shaft made

of aluminum, composite or graphite (not illustrated). It is understood that instead of having tenon 48, wooden shank portion 30 can be integrally formed with a wooden hockey stick shaft.

Blade element 32 comprises a proximal end portion 50 having a tongue 52. As illustrated in Figure 3, tongue 52 is received in groove 44. Blade element 32 also comprises a distal end portion 54 that is remote from proximal end portion 50, inner and outer surfaces 56 and 58 and lower edge 60. Inner and outer surfaces 56 and 58 are continuous with inner and outer sides 36 and 38 respectively.

Blade element 32 is made of a light material such as foam, foam including glass fibers, high-density synthetic foam or thermoplastic polyurethane foam. For example, liquid foam can be injected in a mold where a glass fiber layer has been inserted before in order to manufacture a pre-form blade element made of foam with glass fibers. Such pre-form blade element may be afterwards sanded if necessary in order to obtain blade element 32. Liquid foam sold under the trade-mark MODIPUR, number US 476/20 having a density of 579 kg/m^3 can be used. A glass fiber layer sold under the trade-mark FIBERGLAS, numbers M8608 or M8610 can be used.

Referring to Figure 4, blade portion 10 also comprises inner and outer layers 62 and 64. Inner layer 62 recovers a portion 36A of inner sides 36 of wooden shank portion 30 and inner surface 56 of blade element 32 while outer layer 64 recovers a portion 36B of outer sides 38 of wooden shank portion 30 and outer surface 58 of blade element 32. In fact, inner and outer layers 62, 64 recover inner and outer puck engaging portions 14, 16 respectively.

Layers 62 and 64 are made of a material having rigidity higher than the rigidity of blade element 32. For example, layers 62 and 64 can be made of wood, glass fibers, carbon fibers, kevlar, aluminum, graphite or aramid or a combination of these

materials. In fact, layers 62 and 64 can be made of fibers preformed into laminated sheets with resin wherein the fibers are any combination of glass, carbon, kevlar, aluminum graphite or aramid fibers wherein the percentage of each type of fibers can vary from 0% to 100%. In one embodiment, layers 62 and 64 are unidirectional fiberglass sheets.

In order to increase the impact resistance of the blade portion, inner layer 62 is thicker than outer layer 64. Indeed, the inner side of the curvature of blade portion 10, being the one that hits the puck more frequently, it is the one that must have a better impact resistance. In one embodiment, inner layer 62 is a unidirectional fiberglass sheet having a thickness of 0.75 mm, a density of 1375 g/m^2 and a tensile strength of 7000 N/cm while outer layer 64 is an unidirectional fiberglass sheet having a thickness of 0.35 mm, a density of 635 g/m^2 and a tensile strength of 3000 N/cm.

Advantageously, inner and outer layers 62 and 64 are first inner and outer layers and blade portion 10 also comprises second inner and outer layers 66 and 68 that recover respectively first inner and outer layers 62 and 64 respectively. Second inner and outer layers 66 and 68 are made of woven materials such as glass fibers, carbon fibers, graphite, carbon fibers, quartz fibers or a mixture of carbon fibers, of quartz fibers and of polyethylene fibers or a combination of these materials.

It is understood that by selecting a specific fiber architecture (fiber orientation relative to the longitudinal axis of the blade element) and a specific materials for first inner and outer layers 62, 64 and second inner and outer layers 66, 68, and by selecting a specific material for blade element 32, it is possible to obtain blade portion 10 having the desired mechanical properties. In that sense, it is possible to construct a blade portion having a weight, stiffness and strength adapted for different hockey players as it is now possible to construct a composite hockey stick shaft being flexible, medium stiff, stiff or very stiff. The hockey player will thus be able to select different

combinations of hockey stick shafts and blade portions corresponding to his/her need. For example, a hockey player who plays defense may select a flexible hockey stick shaft and a very stiff blade portion in order to increase velocity of his/her slap shoot.

While allowing to construct a blade portion having specific mechanical properties by using different materials, the present invention also allows to construct a blade portion that offers a feeling which is similar to a blade portion being entirely made of wood since it comprises wooden shank portion 30 having lower edge 46 being part of ground contacting portion 12. It is recognized that the feeling of the ground is dispersed from the heel of the blade portion, to the hockey stick shaft and then to the hands of the player. Since the wood is a better material to disperse such a feeling than a synthetic material, and since the heel is made of wood (see lower edge 46), blade portion 10 thus offers a feeling similar to a blade portion entirely made of wood.

Similarly, since blade portion 10 comprises wooden shank portion 30 having inner and outer sides 36 and 38 that are part of inner and outer puck engaging portions 14 and 16, it offers a feeling similar to a blade portion entirely made of wood. It is understood that the feeling of the ground is dispersed to lower edge 46 even if it is recovered with a thin layer of epoxy, of fiberglass or of other reinforcement materials. In fact, ground contacting portion 12 may comprise a protective layer made of epoxy, fiberglass or tape or a combination of these materials, such protective layer covering lower edge 46 and lower edge 60.

In order to manufacture blade portion 10, groove 44 is cut in front side 42 of wooden shank portion 30. Synthetic blade element 32 is made for example by injecting MODIPUR liquid foam (45 to 70 °C) within a mold where a fiberglass layer has been inserted before. Upon addition of the liquid foam within the mould, the fiberglass layer melds with the liquid foam. After five to ten minutes, the foam is at solid stage and a blade element made of foam having glass fibers is then manufactured. Tongue

52 may be shaped on blade element 32 during the molding operation or afterwards by sanding a portion of blade element 32 in order to reduce its thickness.

Blade element 32 is then affixed to wooden shank portion 30 by inserting tongue 52 in groove 44. Before insertion, an adhesive bonding agent such as epoxy is put on tongue 52 and in groove 44. A portion of inner and outer sides 36 and 38 and inner and outer surfaces 56 and 58 are recovered with first inner and outer layers 62 and 64 made of material such as wood, glass fibers, carbon fibers, kevlar, aluminum, graphite or armid or a combination of these materials. First inner and outer layers 62 and 64 are wetted before with a suitable bonding agent such as resin, epoxy or nylon. First inner and outer layers 62 and 64 are then recovered with second inner and outer layers 66 and 68 made of woven materials such as glass fibers, carbon fibers, graphite, carbon fibers, quartz fibers or a mixture of carbon fibers, of quartz fibers and of polyethylene fibers or a combination of these materials. Again, second inner and outer layers 66 and 68 are wetted before with a suitable bonding agent.

Blade portion 10 is afterwards inserted in a mold and heat and pressure is applied thereto. By the application of heat and pressure, blade portion 10 is curved to any desired curvature typically used by hockey players. When the resin is cured, the mold is opened and blade portion 10 is removed. Excess resin and material along the edges of blade portion 10 are removed with quick trimming and sanding operations (see Figure 9 wherein final blade portion 10 is illustrated in full lines and blade portion before trimming and sanding operations is illustrated in dotted lines).

The above description of preferred embodiments should not be interpreted in a limiting manner since other variations, modifications and refinements are possible within the spirit and scope of the present invention. The scope of the invention is defined in the appended claims and their equivalents.